

**ADDENDUM NO. 4 TO THE
MEMORANDUM OF UNDERSTANDING
BETWEEN U.S. DEPARTMENT OF ENERGY AND U.S. NUCLEAR REGULATORY
COMMISSION ON NUCLEAR ENERGY INNOVATION**

Cooperative Nuclear Safety Research Related to Light Water Reactor Sustainability

I. Purpose and Scope

The purpose of the Department of Energy (DOE)/Nuclear Regulatory Commission (NRC) Memorandum of Understanding on Nuclear Energy Innovation (MOU) is to coordinate DOE and NRC technical readiness and sharing of technical expertise and knowledge on advanced nuclear reactor technologies and nuclear energy innovation.

Consistent with the MOU, nuclear energy innovation may extend to the areas of light water reactor long-term operation (LTO) and proposed modifications for light water reactor sustainability.

Some U.S. nuclear utilities are considering ways to extend the operational life of existing plants, through continued aging management of existing structures, as well as with proposed modifications, such as modernizing instrumentation or diversifying use of nuclear power to achieve competitive revenue generation.

The Light Water Reactor Sustainability (LWRS) Program, sponsored by DOE and coordinated through a variety of mechanisms and interactions with industry, vendors, suppliers, regulatory agencies, and other industry research and development organizations, conducts research to develop technologies and other solutions to improve economics and reliability, sustain safety, and extend the operation of the nation's fleet of nuclear power plants. Coordination between the NRC and DOE's Office of Nuclear Energy (DOE/NE) can inform NRC activities to establish technical bases for the update of regulatory guidance and associated aging management programs to applicants and licensees pursuing LTO, as well as anticipating and resolving potentially safety-significant issues.

This Addendum does not alter the authorities or independence of the NRC and DOE or their abilities to fulfill their responsibilities.

II. Authority.

DOE and NRC enter into this Addendum to the MOU pursuant to Section V. Organizational Implementation of the MOU dated October 7, 2019.

III. Coordination

Consistent with the purpose of the Addendum, the NRC will continue to cooperate with DOE on the LWRS program's five focus areas (pathways): Materials Research, Plant Modernization,

Flexible Plant Operation and Generation, Risk-Informed Systems Analysis, and Physical Security.

This coordination includes a wide variety of activities including information exchange meetings, support for expert panels, demonstrations and pilots, jointly sponsored projects, and research aimed at achieving light water reactor sustainability objectives, including but not limited to digital instrumentation and control. Digital transformation for nuclear plant automation amongst U.S. nuclear power plants is intended to improve plant operations by utilizing new and emerging technologies to (1) maintain high levels of safety and reliability, and (2) improve the efficiency of licensee regulatory compliance.

The cooperative program elements under this Addendum include:

1. Programmatic Information Exchange. Both Parties will exchange information concerning the objectives, priorities, project scopes, milestones, planned approaches, and schedules for their ongoing and planned LWRS-related tasks.
2. Technical Information Exchange. Both Parties will facilitate the timely exchange of technical information between researchers and project managers. Findings of technology demonstrations or pilots and the data needs associated with regulatory oversight will be exchanged. These technical exchanges are particularly important in cases where, to avoid unnecessary duplication of research efforts, NRC and DOE/NE agree to communicate regarding a division of research effort. This also includes support of working meetings between technical staff (on an agreed-upon as-needed basis).
3. Cooperative Research on Light Water Reactor Sustainability Issues. NRC and DOE/NE are supporting initiatives aimed at:
 - a. Improving aging management during LTO at commercial nuclear facilities.
 - b. Addressing long-term aging and modernization or replacement of legacy instrumentation and control technologies by research, development, and testing of new instrumentation and control technologies and advanced condition-monitoring technologies for more automated and reliable plant operation.
 - c. Exploring the feasibility of flexible plant operations and supplying energy to industrial processes, including technical and licensing basis information needed.
 - d. Developing and evaluating improved risk-assessment methods that enable more cost-effective plant operation, supporting effective safety margin management for both active and passive structures, systems, and components of nuclear power plants.
 - e. Develop and evaluate methods, tools, and technologies that advance the technical basis necessary to optimize and modernize a nuclear facility's security posture.

NRC and DOE/NE will exchange technical information related to nuclear safety and technical readiness in the areas identified in this Addendum. NRC and DOE/NE will continue to participate jointly, when appropriate, in the identification of additional areas of mutual interest for cooperative activities that should be added to this Addendum.

IV. Roles and Responsibilities of Each Party

This coordination is primarily centered around sharing of information and research activities. There are no formal or written project reports required. Both DOE and the NRC will identify Points of Contact (POCs) to coordinate NRC-DOE interactions as listed below.

DOE

DOE will provide oversight and direction in accordance with the MOU, funding authorization, and the DOE/NE's mission and objectives.

The following are the anticipated DOE Roles and Responsibilities:

- Identify a single DOE POC (Reactor Optimization and Modernization team lead) to coordinate DOE-NRC interactions
 - For specific LWRS program pathways, POCs within DOE will be identified.
- Provide technical information to the NRC from DOE subject matter experts who possess appropriate experience and expertise
- Provide NRC technical staff with access and the opportunity to observe and learn about light water reactor sustainability research activities and technology demonstrations
- Conduct technical review meetings as needed and invite staff from various national laboratories who are involved in model development and experimental research

NRC

The NRC, consistent with its role as an independent safety and security regulator, is responsible for providing accurate, current information on the NRC's regulations, licensing processes, and regulatory guidance. Consistent with the MOU and the NRC's role as an independent safety and security regulator, and within the bounds of the NRC's statutory mandate and available budgeted resources, the NRC will share research and share information gaps related to light water reactor sustainability.

The NRC will neither make recommendations regarding specific commercial reactor design or modification concepts nor participate in any concept selection process.

The following are the anticipated NRC Roles and Responsibilities:

- Identify POCs within the NRC to work with the DOE POC to coordinate DOE-NRC interactions
 - For overall DOE-NRC LWRS interactions: LTO Research Lead, NRC Office of Nuclear Regulatory Research, Division of Engineering (NRC/RES/DE)
 - For the topics corresponding to LWRS program pathways, POCs within NRC/RES will be identified
- Provide current information on aging management research that could inform DOE/NE research efforts in experimental and analytical activities
- Provide current information on risk analysis research that could inform DOE/NE research efforts in experimental and analytical activities

- Provide current information on licensing and regulatory reviews of emerging technologies to prioritize regulatory needs
- Share technical information on safety and security analysis from NRC subject matter experts who possess appropriate experience and expertise, as necessary

V. Funding Authorization

This Addendum is neither a fiscal nor a funds obligation document and does not authorize expenditure or reimbursement of appropriated funds. To the extent activities discussed in this Addendum would require resources beyond the NRC’s existing authority, the parties may agree to enter into Implementing Interagency Agreements (IAAs), supplemental to the MOU and this Addendum, that address such activities.

VI. Organizational Conflicts of Interest

DOE and the NRC are mindful of the organizational conflict of interest requirements and obligations of the respective agencies including Section 170A of the Atomic Energy Act of 1954, as amended. DOE and the NRC will work together to resolve any organizational conflicts that may arise.

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Date: _____